MEA 2016–2017

Science Grade 8

The table below shows the entire eighth grade science test design. Scores are based on common items only, half of which are released and can be found in this document.

Test Design

Content Area	Common		Field Test Items		Total Items per Student		Base Testing Time	Points
	MC	CR	MC	CR	MC	CR		
Science	40	4	8	1	48	5	105 min.	56

Each item on the MEA measures a content standard of Maine's 2007 *Learning Results*.

Science Content Standards Assessed on the MEA

D. The Physical Setting
1. Universe and Solar System
2. Earth
3. Matter and Energy
4. Force and Motion

E. The Living Environment
1. Biodiversity
2. Ecosystems
3. Cells
4. Heredity and Reproduction
5. Evolution

Item Information Chart

Please refer to the item information chart on the next page for in-depth information on each science released item. The released item numbers in the chart correspond to item numbers in the practice test and on the MEA Item Analysis Report.

Constructed-Response Scoring Guides

A constructed-response scoring guide includes score point descriptions used to determine the score. Training notes that follow the scoring guide provide in-depth descriptions or particular information also used to determine the score.

Student Work

At least one sample student response is provided for each score point with annotations that explain the reasoning behind the assigned score.

Grade 8 Science Released Item Information

Released Item Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Practice Test Page Number	2	2	2	3	3	3	4	4	4	5	5	6	6	7	7	7	7	8	8	8	9	10
Content Strand (Maine 2007 *Learning Results*)	D.2.a	E.5.c	D.2.b	D.4.b	E.5.d	E.4.b	D.3.a	D.2.c	E.4.a	D.1.b	E.5.a	E.5.b	D.4.e	D.3.j	E.4.c	D.1.a	D.3.k	D.3.g	E.1.c	D.3.f	D.2.f	E.3.c
Depth of Knowledge Code	1	2	1	2	2	2	2	3	1	3	2	2	2	2	2	2	2	2	1	2	2	2
Item Type	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	CR	CR
Possible Points	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4
Answer Key	C	D	A	A	B	A	C	D	A	D	C	A	B	A	C	A	B	A	A	B		
% Who Chose A or Earned 1 Point	2	6	91	46	7	85	12	5	79	6	15	75	9	52	8	51	9	35	76	19	8	23
% Who Chose B or Earned 2 Points	3	5	3	24	68	5	7	17	6	7	6	6	62	22	28	8	62	24	7	70	23	15
% Who Chose C or Earned 3 Points	74	3	3	21	13	4	59	11	5	29	73	6	18	5	60	5	18	22	6	4	35	22
% Who Chose D or Earned 4 Points	20	86	3	9	11	5	22	67	10	58	5	12	10	20	3	36	10	18	11	6	24	17
Statewide Average Student Score																					2	1.9

Content Strands: See "MDOE Regulation 132–*Learning Results: Parameters for Essential Instruction*" at http://www.maine.gov/education/lres/pei/index.html.

Item Type: MC = multiple choice, CR = constructed response

Answer Key: the letter of the correct answer choice

MEA Science Grade 8 Released Items – Student Work

Constructed-Response Item 21

21 The Appalachian Mountains in the eastern part of the United States have formed and re-formed during the past 480 million years. At one point in their history, they were the size of the current Rocky Mountains in the western part of the United States, with peaks above 14,000 ft. Today, the tallest mountain in the Appalachian Mountains is Mt. Mitchell at 6,684 ft.

a. Describe **two** ways that mountains can form.

b. Explain **two** ways that mountains can change shape and size over time.

Scoring Guide for Constructed-Response Item 21

Score	Description
4	Response demonstrates a thorough understanding of how mountains form and change slowly over time. Response describes two ways that mountains can form and explains two ways that mountains change shape and size. Response has no errors or omissions.
3	Response demonstrates a general understanding of how mountains form and change slowly over time. Response has an error or omission.
2	Response demonstrates a limited understanding of how mountains form and change slowly over time. Response has errors and omissions.
1	Response demonstrates a minimal understanding of how mountains form and change slowly over time. Response is minimal.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes for Constructed-Response Item 21

Responses may include:

a. Possible ways mountains can form:

- Mountains can form from volcanoes when the solid and liquid rock in the Earth's interior gets pushed to the surface.
- Mountains can form when two plates collide, one pushing under the other (or pushing up together), causing rock to uplift and fold.
- Mountains can form in the ocean, like mid-ocean ridges where [molten] lava comes to the surface and builds mountains.

b. How mountains can change shape and size:

- Rain, ice, and snow can cause mountains to erode.
- Water can get into the cracks of rock, freeze, expand, and cause rocks to eventually break apart.
- Water also dissolves some minerals, washing them out of the rocks. This causes rocks to break and crumble.
- Wind erosion can cause mountains to crumble and break over time.
- Glaciers can scrape off the sides of mountains and leave debris behind during retreat.
- Volcanic eruptions can change the size and shape of mountains.
- Earthquakes can change the size and shape of mountains.
- Plants or chemicals can cause erosion.
- Strip mining (any large scale human impact, including development) causes changes in mountain shapes.
- Avalanches or rock slides can change a mountain's size and shape.

Part A is worth 2 points and part B is worth 2 points.

Note: For a score of 3, three correct identifications with description/explanation are required.

Sample 4-Point Response with Annotations for Constructed-Response Item 21

There are two ways that mountains can form. One way is when the techtonic plates move it pushes the mountains upward to create mountains this is how the Rocky mountains and the Appalachian mountains were formed. The other way mountains are formed is from volcanic exposions. After volcanoes explode several times and the lava cools it can create mountains. This is how Hawaii and Mt. Kilimanjaro were formed. The two ways that mountains can change shape is with erosion over large amounts of time water and other elements will wash away some of the mountain this is how scientists know that the Rockey mountains are younger than the Appalaichians Another way mountains can change is more volcanic eruptions or the techtonic plates moving even more.

Summary Annotation Statement:

Part A received two points because it mentioned both plate tectonics and volcanoes, with full descriptions. Part B also received two points because it mentioned erosion, plates, and volcanoes with full explanations. As a whole, the answer demonstrates a thorough understanding.

Sample 3-Point Response with Annotations for Constructed-Response Item 21

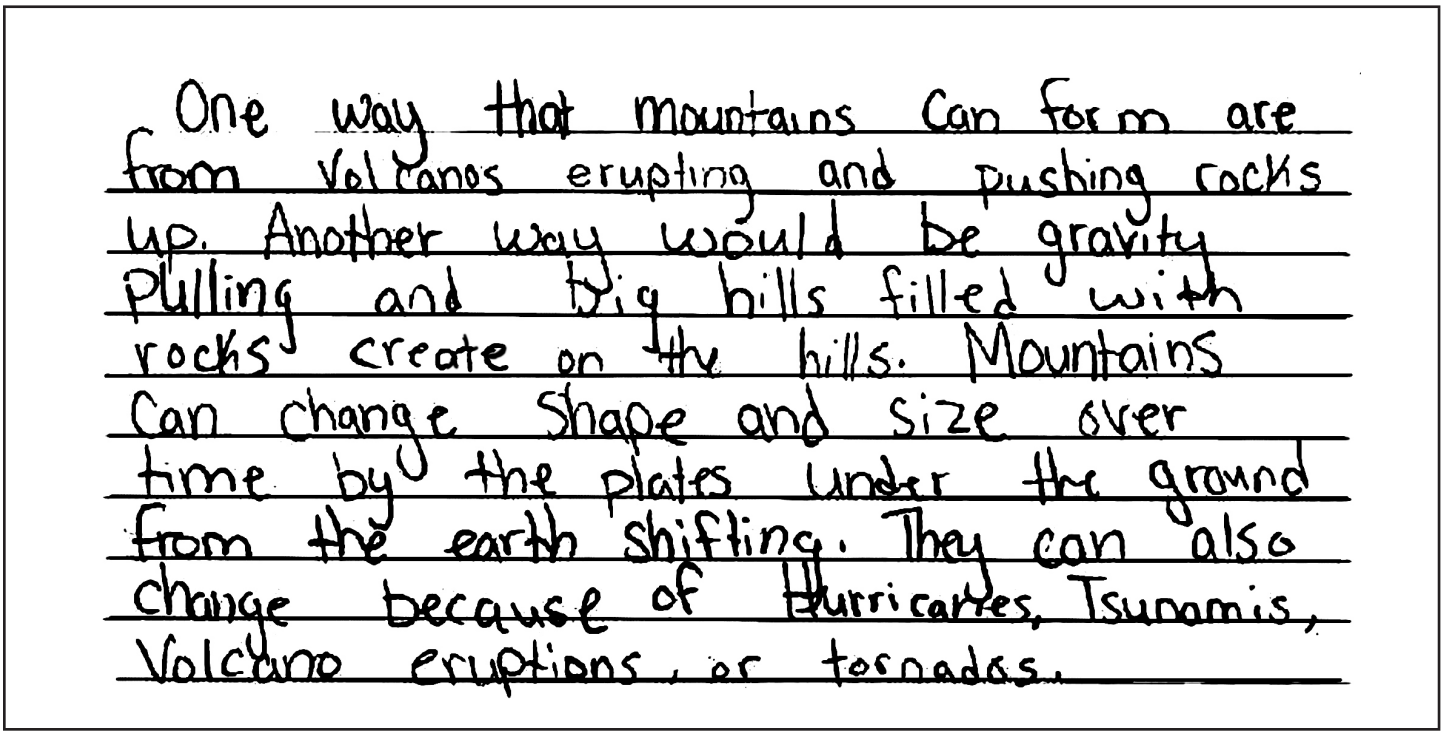
a) One way that mountains can form is by the movement of tectonic plates. When two plates collide, one or both of the plates may be pushed upward, creating a mountain. Another way they form is when sediment is carried by water and creates peaks of land over time.

b) Mountains can change shape and size by erosion, where wind, rain, and ice wears away at the mountain. They can also change shape or size more rapidly when a disturbance causes a landslide or rocks to fall from the side of the mountain. This could be caused by earthquakes, human disturbances, etc.

Summary Annotation Statement:

Part A received one point because it mentioned tectonic plates, and offered an adequate description. Part B received two points because it mentioned erosion, but describes weather and landslides. The answer demonstrates a general understanding.

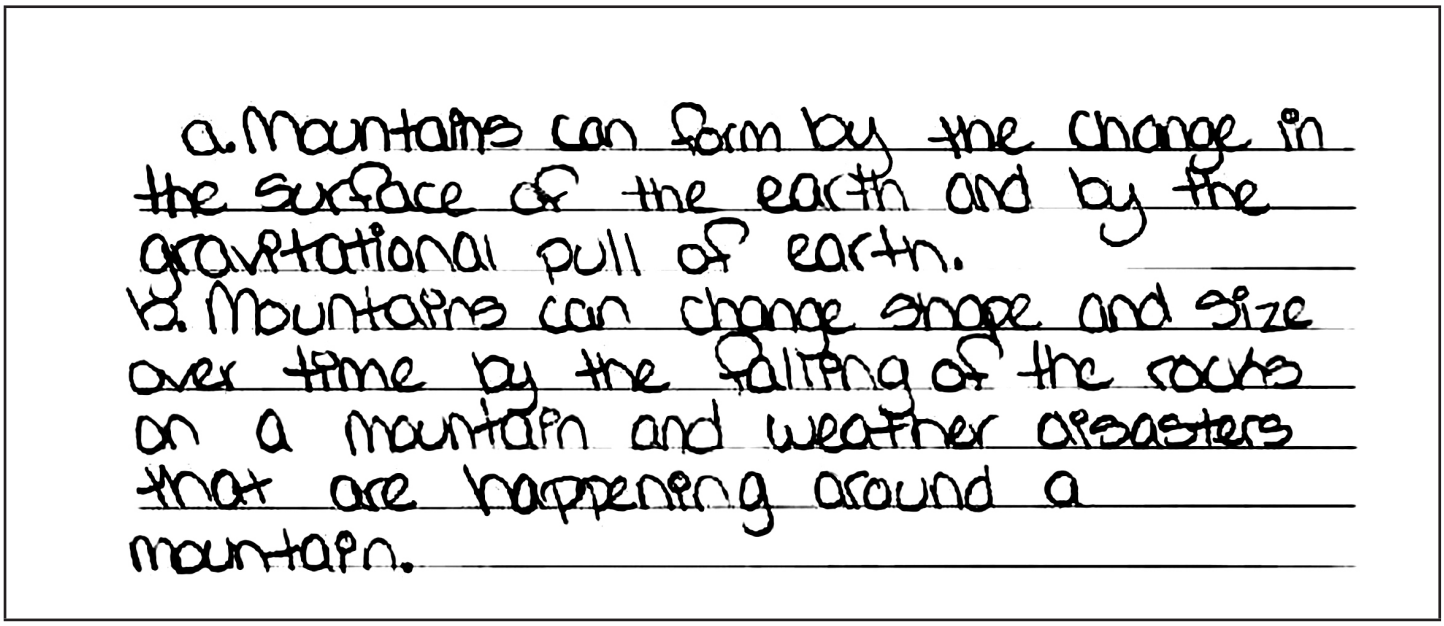
Sample 2-Point Response with Annotations for Constructed-Response Item 21


One way that mountains can form are from volcanos erupting and pushing rocks up. Another way would be gravity pulling and big hills filled with rocks create on the hills. Mountains can change shape and size over time by the plates under the ground from the earth shifting. They can also change because of Hurricanes, Tsunamis, Volcano eruptions, or tornados.

Summary Annotation Statement:

Part A received one point because it mentioned volcanoes and offered some description. Part B also received one point because it mentioned shifting plates and weather, but did not offer an explanation. The scorer has indicated that 'listing' reasons with limited explanations demonstrates a limited understanding.

Sample 1-Point Response with Annotations for Constructed-Response Item 21


a. Mountains can form by the change in the surface of the earth and by the gravitational pull of earth.
b. Mountains can change shape and size over time by the falling of the rocks on a mountain and weather disasters that are happening around a mountain.

Summary Annotation Statement:

Part A received no points. Part B received one point for mentioning falling rocks and weather, but the answer did not offer any explanations. This answer, overall, demonstrates minimal understanding.

Sample 0-Point Response with Annotations for Constructed-Response Item 21

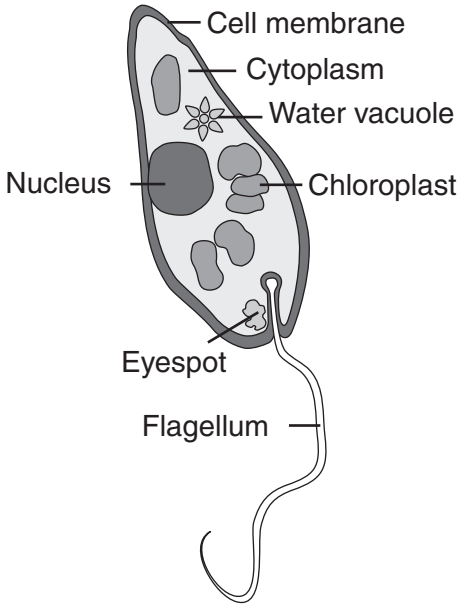
The Appalachian Mountains formed and grew over the past 480 million years. Two ways how the mountains formed would be over the time they have formed a new shape. The mountains could have reproduced and kept growing and that could have formed new shape and size.

Summary Annotation Statement:

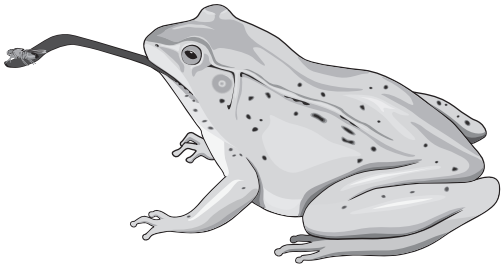
No credit was awarded here.

Constructed-Response Item 22

22 The pictures below show a single-celled euglena and a multicellular frog.



Euglena



Frog

a. Identify **two** structures of the euglena and then name two structures of the frog that have a similar function to the structures you chose for the euglena.

b. Describe the function of **each** of the four structures you chose for part a.

Scoring Guide for Constructed-Response Item 22

Score	Description
4	Response demonstrates a thorough understanding of structures in single-celled and multicellular organisms that have similar functions. Response identifies two structures in euglena and two similar structures in the frog, and describes what the function of each structure is. Response has no errors or omissions.
3	Response demonstrates a general understanding of structures in single-celled and multicellular organisms that have similar functions. Response has one error or omission.
2	Response demonstrates a limited understanding of structures in single-celled and multicellular organisms that have similar functions. Response has errors and omissions.
1	Response demonstrates a minimal understanding of structures in single-celled and multicellular organisms that have similar functions. Response contains one structure with its correct function. Response is minimal.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes for Constructed-Response Item 22

Examples of pairs of structures in the two organisms that have similar functions:

- The chloroplasts in the euglena use sunlight to make food by photosynthesis. (They also can absorb food through the cell membrane.) And the long, sticky tongue of the frog catches insects (food).
- The flagellum of the euglena provides movement. And the legs of the frog provide movement.

Note: Responses may choose other pairs of structures (e.g., euglena's cell membrane and frog's skin for protection of the organism).
Note: A pair (two analogous parts) of structures must be given to receive credit.
Note: Eye and eyespot are acceptable.

Part A is worth 2 points and part B is worth 4 points.

Score Conversion

6 points = 4
4–5 points = 3
2–3 points = 2
1 point = 1

a. Two structures of the euglena are the cell membraine and the nucleus. Two structures of the frog that have a similar function are the frog's skin and the frog's brain,
b. The function of the euglena's cell membrane is to keep unwanted items that could damage the cell out. This is like the function of the frog's skin because the skin keeps harmful items out of the frog's body. The nucleus is like the control center of the cell. It tells other parts what to do and when to do it. The frog's brain tells other Dragons in the body how and when to perform their specific function.

Summary Annotation Statement:

Part A selects two similar pairs: a nucleus and a brain; skin and a cell membrane. Both explanations in Part B are valid.

Sample 3-Point Response with Annotations for Constructed-Response Item 22

A. The Euglena has a flagellum that help it move. The frog has legs that help it move. The Euglena has a cell membrane and the frog has cell membranes on its cells.

B. The flagellum and legs are to help the Euglena and frog move. The cell membranes are for protecting the Euglena and the cells in the frog.

Summary Annotation Statement:

Part A correctly pairs flagellum with legs. No credit was given for the cell membrane; a frog's cell membranes do not protect the organism as a whole. Part B correctly discusses flagellum and legs, and also provides an accurate description of the role of the Euglena cell membrane.

Sample 2-Point Response with Annotations for Constructed-Response Item 22

Two structures of the Euglena and the frog that have a similar function is the nucleus and the cell membrane. Also the cytoplasm and the water vacuole. The nucleus is almost like the brain of the cell. It holds the instructions to all life. DNA. The function of the cell membrane is a flexey substance to help protect the inside and outside of the cell. If the cell didn't have this then the cell would die. The function of the cytoplasm is it's kind of like food for the other parts of the cell. This is very important in the cell world. The function of the water vacuole is it stores water so it can let the water out to clean the cell.

Summary Annotation Statement:

Part A does not correctly name any pairs. Part B offers a valid explanation of the cell membrane and vacuole. The explanation of the nucleus does not offer enough information to receive credit, because it does not touch on the fact that the nucleus controls the cell. The student's comparison of the nucleus as the brain of the cell did not receive credit because the answer to Part A was incorrect.

Sample 1-Point Response with Annotations for Constructed-Response Item 22

a.) Two structures for the Euglena are the cell membrane and nucleus. (I dont know two structures for the frog.)

b.) The nucleus controls the Eugelenas body, to help its instints while the cell membrane helps the Euglena move and controls what the Euglena does, sort of like its brain.

Summary Annotation Statement:

Part A selects two structures in the Euglena, but does not reference any analogs in the frog. Part B correctly, yet briefly, describes the function of the nucleus.

Sample 0-Point Response with Annotations for Constructed-Response Item 22

An Euglena has a long tung and so does a frog and they both eat insects.

Summary Annotation Statement:

No credit was awarded here.